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# HIV-associated opportunistic infections

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**Conflict of interest**

The authors declare that they have no conflict of interest in the publication of this article.

## *Abstract*

***Introduction:*** *opportunistic infections (OIs) are the most frequent cause of morbidity and mortality among HIV/AIDS patients.* ***Materials and methods:*** *This is a descriptive, retrospective, quantitative, non-experimental, retrospective study carried out from the analysis of the database of a second level hospital in the province of Guayas, in the period from January to December 2018.* ***Results:*** *Toxoplasmosis and tuberculosis were the OIs with the highest incidence (29% of cases), followed by pneumocystosis (21% of cases).* ***Conclusion:*** *We compared the results obtained and determined that the incidence of OIs is similar to that reported by other studies.*

***Keywords:*** *Opportunistic Infections; Incidence; HIV Infections; AIDS-Related Opportunistic Infections; Acquired Immunodeficiency Syndrome;*





# Infecciones oportunistas asociadas a VIH

***Resumen***

***Introducción:*** *las infecciones oportunistas (IOs) son la causa de morbimortalidad más frecuente entre pacientes con VIH/SIDA.* ***Materiales y métodos:*** *El presente es un estudio, descriptivo, retrospectivo, cuantitativo, no experimental, efectuado del análisis de la base de datos de un hospital de segundo nivel de la provincia del Guayas, en el periodo de enero a diciembre de 2018.* ***Resultados:*** *la toxoplasmosis y la tuberculosis fueron las IOs con mayor incidencia (29% de casos), seguida de la neumocistosis (21% de casos).* ***Conclusión:*** *Se compararon los resultados obtenidos determinando que la incidencia de las IOs es similar a la reportada por otros estudios.*

***Palabras clave:*** *Infecciones Oportunistas; Incidencia; Infecciones por VIH; Infecciones Oportunistas Relacionadas con el SIDA; Síndrome de Inmunodeficiencia Adquirida;*

**Introduction**

The human immunodeficiency virus (HIV) is a lentivirus of the *Retroviridae* family, and can be transmitted through exchange or contact with body fluids (seminal fluid, vaginal fluid, etc.), blood transfusions from infected patients, sexual contact (especially in unsafe sex acts), pregnancy or breastfeeding (mother-to-child transmission), among others (1); through depletion of the T-CD4 lymphocytes ( targeted cells destroyed in the process of viral replication) it affects the immune system, resulting with impaired immunity and vulnerability to opportunistic infections, which are characterised with high morbidity and mortality (2–4).

Acquired immunodeficiency syndrome (AIDS), which was first recognised in the United States in a group of men who have sex with men (MSM) in 1981, although HIV infection was initially limited, literally exploded epidemiologically in the final decades of the 20th century, becoming the worst epidemic of its kind; More than 35 million HIV-related deaths make it one of the largest public health problems in the world; the estimated number of people living with HIV at the end of 2008 was 33.4 million, but the reported statistics on the global burden of HIV were 36.7 million persons living with HIV. Seven million people living with HIV/AIDS, 1.8 million new HIV infections and 1 million AIDS-related deaths at the end of 2016 (5–7).

The primary mechanism of HIV transmission in adults is through unprotected sex; among paediatric cases (under 15 years), 90% of infections are attributable to vertical transmission; epidemic patterns have varied over time in some regions, after sub-Saharan Africa, the Caribbean has the second highest HIV prevalence rate in the world, in the 17 countries that make up the Latin American region, approximately 1.8 million adults and children are living with HIV; overall HIV prevalence is 0.5%, Brazil with its large population accounts for 830,000 people living with HIV, in 2016 the number of new HIV infections was 96,000; the HIV epidemic is particularly concentrated among MSM across Latin America and in certain Caribbean countries, approximately 30% of MSM in Jamaica are infected with HIV (5,6).

*Opportunistic infections*

Opportunistic infections (OIs) are defined as those with a more frequent onset and more severe outcome due to immunosuppression related to untreated HIV infection, caused by a progressive reduction in cell-mediated immunity, as reflected by a decrease in the number of activated T-CD4 lymphocytes (1); In addition to *Pneumocystis jirovecii* pneumonia (PCP) and bacterial pneumonia, there are millions of people who are co-infected with HIV and tuberculosis (TB), so determining any possible exposure to active TB is an important part of the medical history; histoplasmosis and cryptococcosis remain

common diseases in the absence of antiretroviral therapy (ART), as does Toxoplasma meningoencephalitis (TM), especially in developing countries (5–12).

**Materials and methods**

The present study is a descriptive, retrospective, non-experimental study. Data analysis was carried out using an anonymised database from a second level care hospital in the province of Guayas.

The data were analysed and quantified to determine the incidence of OIs. In collaboration with the staff of the hospital unit, a numerical code was used as the only identifying data to avoid duplication of cases, with the aim of determining the incidence of OIs in patients with HIV infection who required hospitalisation. The study was approved by the teaching and research sub-directorate of the care unit.

The results below show the comparison between the total number of patients diagnosed with HIV from the different units that were categorised as outpatient, inpatient (including intensive care) and emergency, based on the inclusion and exclusion criteria.

Access to the care database in a spreadsheet format was requested to obtain patients from a second level care hospital in the province of Guayas, to determine the total number of inpatient HIV care for opportunistic diseases; the incidence of HIV-related inpatient care was then analysed to determine the incidence of OIs and the type of diagnosis of patients, classifying newly diagnosed patients and those on antiretroviral treatment (ARV).

Inclusion criteria: Patients with a diagnosis of HIV infection (2 reactive tests or 1 reactive test and 1 confirmatory test, either viral load or Western-Blot). Diagnosis of opportunistic infection for the first time. Hospitalisation between 1 January 2018 and 31 December 2018, for OI.

*Exclusion Criteria: Patients with non-HIV-associated immunosuppression. Patients with a previous diagnosis of opportunistic infection. Hospitalisation between 1 January 2018 and 31 December 2018, for non-infectious causes associated with HIV. Patients hospitalised between 1 January 2018 and 31 December 2018, for non-opportunistic infections.*

*Ethical aspects*

Ethical aspects

For the development of the present study, authorisation and validation of the research protocol was obtained from the sub-directorate of teaching and research of the unit where the study was carried out. Subsequently, the preparation of an anonymised database was requested by the infectious disease department of the host institution, and the staff checked inpatient care, filtering out first-time diagnoses of opportunistic infection among HIV patients.

*Study limitations*

The selected hospital began providing care to inpatients in March 2017; at the time of the study it had been in operation for 1 year and 6 months. The hospital currently treats cases of moderate complexity, in accordance with the regulations established by the Ministry of Public Health for units at the 2nd level of complexity. The hospital did not have reagents for CD-4 count or detection and quantification of viral load for HIV-1, and also, due to its level of complexity, it did not have some reagents for detecting opportunistic infections, so it uses external providers by agreement, which in some cases delays the diagnosis, as a result of the administrative procedures required to perform these tests.

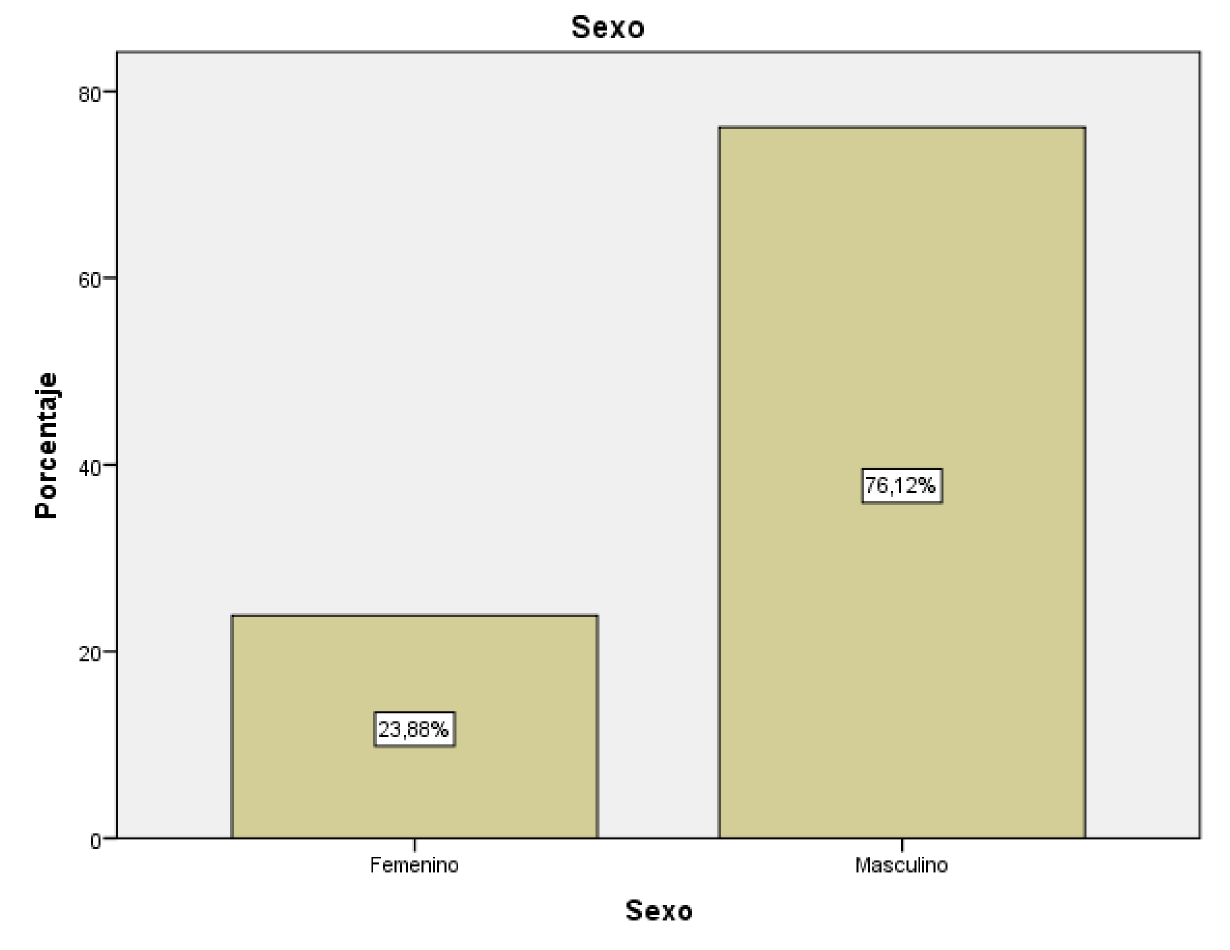
**Results**

From the data analysed for the period January to December 2018, a total of 734 HIV patients received care, of which 729 corresponded to patients who were admitted to hospital, of which 67 were first-time patients and 668 were subsequent inpatients diagnosed with HIV (table 1).

**Statistics**

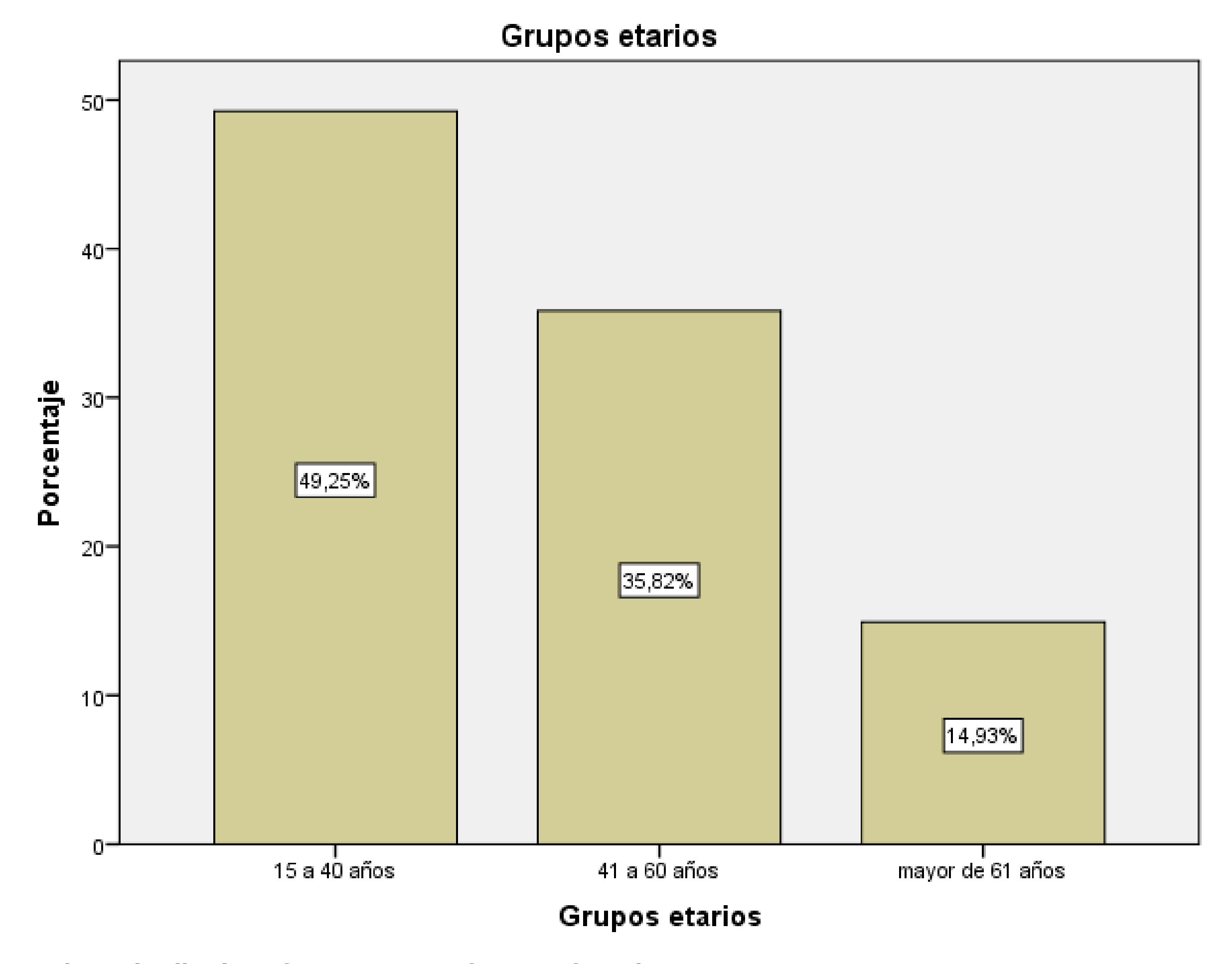
| | | Age | Sex |
|---|---|---|---|
| N | Valid | 67 | 67 |
| | Missing | 0 | 0 |
| Average | | 42,97 | |
| Minimum | | 23 | |
| Maximum | | 93 | |

**Table 1. Statistics by age and sex of the study sample.**




**Graph 1. Percentages by sex.** Predominance of cases between the male (masculino in Spanish) sex.

Graph 1 shows that the majority of cases of OIs were observed in the male sex (76.12%) over the female sex (23.88%).
The age group in which most cases of OIs were observed was 15-40 years (49.25%), followed by 41-60 years (35.82%) and to a lesser extent those over 61 years (14.93%), as detailed in graph 2, with a mean age of 42.97 years.




**Graph 2. Distribution of percentages of cases of OIs by age group.**





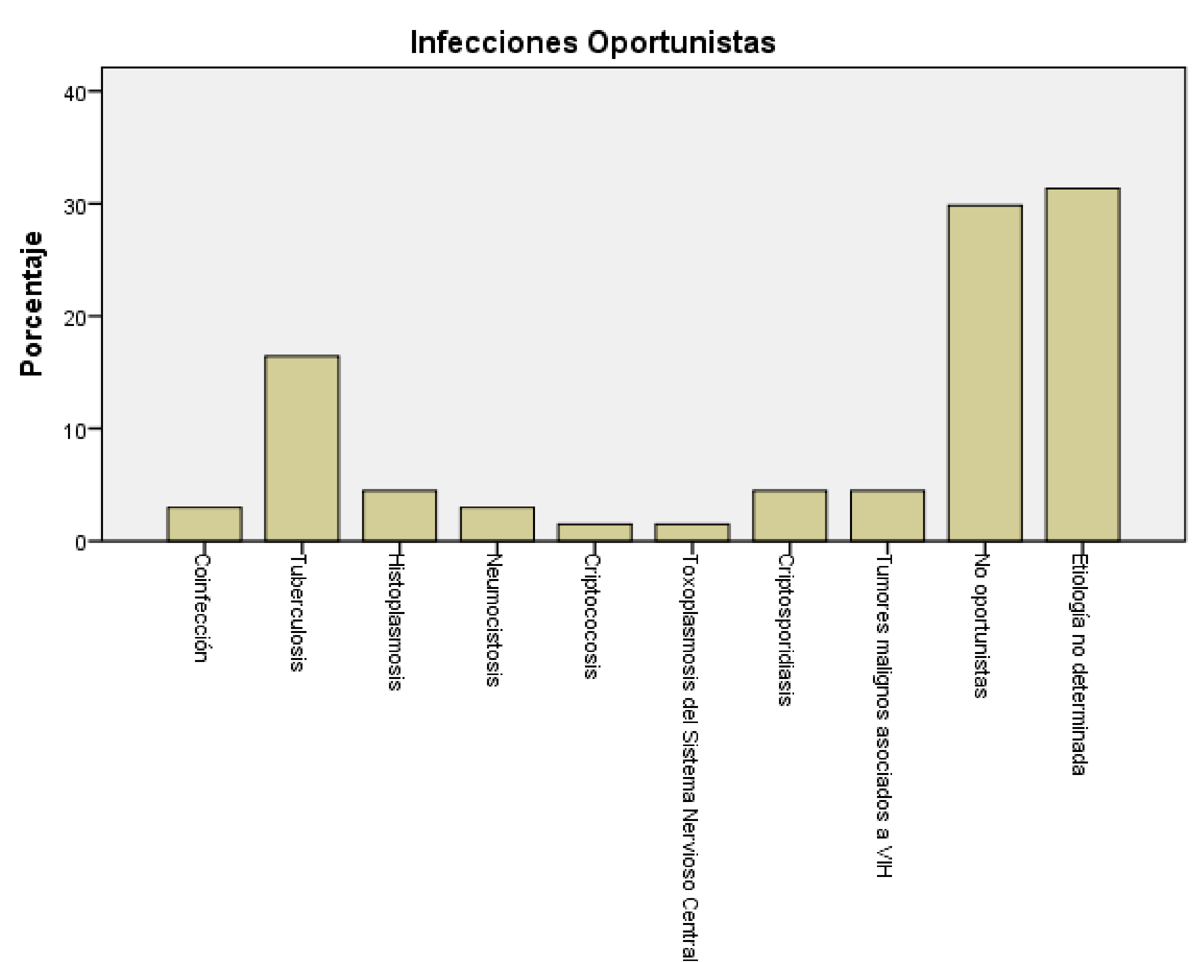



**Figure 3. Percentage of cases of OI infections.**

The bar graph 3 shows the percentage of cases of OIs, with tuberculosis being the most frequent with 16.4%, followed by Histoplasmosis, cryptosporidiosis and HIV-associated malignant tumours (see N and percentages in table 2).

**Opportunistic Infections**

| | | Frecuency | Percentage | Valid Percentage | Cumulative percentage |
|---|---|---|---|---|---|
| Válido | Co-infection | 2 | 3,0 | 3,0 | 3,0 |
| | Tuberculosis | 11 | 16,4 | 16,4 | 19,4 |
| | Histoplasmosis | 3 | 4,5 | 4,5 | 23,9 |
| | Pneumocystosis | 2 | 3,0 | 3,0 | 26,9 |
| | Cryptococcosis | 1 | 1,5 | 1,5 | 28,4 |
| | Toxoplasmosis of the central nervous system | 1 | 1,5 | 1,5 | 29,9 |
| | Cryptosporidiasis | 3 | 4,5 | 4,5 | 34,3 |
| | HIV-associated malignant tumours | 3 | 4,5 | 4,5 | 38,8 |
| | Non-opportunistic | 20 | 29,9 | 29,9 | 68,7 |
| | Etiology not determined | 21 | 31,3 | 31,3 | 100,0 |
| | Total | 67 | 100,0 | 100,0 | |

**Table 2. Descriptive statistics of the opportunistic infections in the sample.**

The overall attack rate of opportunistic diseases in the studied sample was 42.42 per 100 cases per year, being 12.12 for TB and MT, followed by 9.09 for pneumocystosis, 4.55 for histoplasmosis, 3.03 for cryptosporidiosis and 1.52 for cryptococcosis.









## Discussion

The estimate of individuals worldwide with HIV infection at the end of 2014 was about 36.9 million, of whom only 40% were receiving ART; community-acquired pneumonia (CAP) represents a major cause of morbidity in HIV patients and it has been estimated that 5% to 20% of hospitalised HIV patients suffer from bacterial pneumonia, but only 35% of cases result in an aetiological diagnosis; Legionella pneumophila infection remains uncommon in HIV/AIDS patients, other less prevalent aetiological agents are *Rhodococcus equi* and *Nocardia asteroides*; *Pneumocystis jirovecii* pneumonia was the first documented opportunistic infection in HIV patients, with an estimated 75% chance of developing it during the course of infection (13).

Lopera and Lemos (2019), in Colombia, analysed 37,325 records of people with HIV, and found that 18% had had at least one opportunistic infection, the most prevalent in adults being TB and cerebral toxoplasmosis. The incidence of the study carried out in the second level hospital shows that there is a higher incidence of these diseases compared to other opportunistic or AIDS-phase marker diseases (14).

Vinod et al. (2018), in the study conducted in India, in the period January 2012 to January 2013, identified 100 OIs in a sample of 424 newly diagnosed HIV-positive patients, the most frequent opportunistic infection detected was candidiasis (52%), followed by TB (50%), with an incidence of opportunistic infection was 23.59/100 (15).

Kasthuri et al. (2018), a prospective cohort study in India conducted from June 2004 to June 2010, collected faecal samples from 207 HIV patients and 20 controls, of which they had intestinal OIs such as cryptosporodiasis (15%), isosporiasis (6.3%), cyclosporiasis (1%), strongyloidiasis (3.9%) and microsporodiasis (0. 5%); other OIs were found during routine screening as pulmonary TB (20.3%), candidiasis (15.5%), extra pulmonary TB (5.2%), herpes infection (3.4%), toxoplasma infection (2.4%) and Cytomegalovirus (2.4%) (16).

## Conclusion

OIs are important pathological entities, usually tending to appear when the CD4 count falls below 200 cels/ml, hence immunosuppression is the main cause of their appearance.

In the study carried out in another Latin American country, it was determined that the prevalence tends to be similar to the incidence found in our study, which, compared to studies carried out in India, is reinforced by the relationship of opportunistic infections most frequently found in HIV patients.

The assessment of the state of the art reaffirms the importance of timely diagnosis of HIV infection, as well as of the existence of opportunistic infections, since ART with the restoration of immune status improves the results of therapy and the clinical evolution of patients.

A multicentre study is recommended to determine the incidence and prevalence of OIs in the country.

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